SCIENCE

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DEAF-MUTES: THEIR INTERMARRIAGE AND OFFSPRING.

DR. ALEXANDER GRAHAM BELL says (*Science*, Dec. 26, 1890), "I cannot agree with Dr. Gillett that it is not a very great calamity to have a deaf and dumb child." I never made that statement, and shall not make it now. What I have said is, that what was once a calamity is now, to those deaf persons who improve the privileges and opportunities they enjoy under our civilization, reduced to a very serious inconvenience. Dr. Bell says, "The deaf themselves surely will not indorse it." I am glad to say, and I hope Dr. Bell will be glad to know, that some very intelligent deaf persons whom I have the pleasure of knowing, and some others whom I have never seen, do indorse it in letters to me since its publication. One gentleman whom I never saw writes me, "I have read your article in *Science*, Dec. 26. Allow me, as a man deaf, to express my most hearty approval of all you protest against for ever holding up the deaf as victims of a terrible misfortune, and objects of commiseration and charity. As I read the article, so intensely do I sympathize with every word, that I could scarcely refrain from dancing around the room with delight." Another, whom I am proud to number among my former pupils, a man filling an honorable and important station in life, who has for many years been battling with the world and well maintaining his family, writes, "Now, my dear doctor, I want to thank you for your very able article in *Science*, Dec. 26. The whole mute population is under everlasting gratitude to you for the noble and able stand you have taken." A lady (married) writes, "I have read your article on the intermarriage of the deaf with deep interest. May the Lord inspire you more and more to plead the cause of the deaf, and show you in a way that will counteract the plausible reasoning of other learned men, who think they know just what is proper for us, and would legislate us into marriage with hearing persons, and rob us of more domestic happiness than their theories would secure us in a thousand years, if we could live to that age." Another gentleman, writing me with reference to my article, says,, "I cannot look upon my deafness as a serious calamity or a grave misfortune; and I dare say that an older, better, and more experienced person than I — my dear, noble mother — will share my sentiments thus expressed. She may have thought it a great calamity when I became deaf in infancy, but she would not say so to-day." I could give others of similar import, but these will suffice to show that there is manly, self-reliant spirit in many of the deaf to a greater degree than some may have credited them with. I did not expect that any whose capital mainly consists of "grave misfortune" to work upon the sympathy of others, and many who have been educated to view themselves as specially unfortunate, would at once coincide with my view. I suppose that some think, as it seems Dr. Bell does, that most if not all of the deaf will cling to the idea, "I am a poor unfortunate deaf-mute; somebody will take care of me" I fancy that I have had more experience along the line of urging the deaf to self-reliance than some who write very glibly about "a very great calamity" and "a grave misfortune." If Dr. Gallaudet and Dr. Bell would get down from their high horses, and labor for a few years in daily intercourse with all classes and grades of deaf-mutes, possibly they might have a better appreciation of some difficulties encountered by the workers among the dull as well as the bright.

With reference to "the calamity of having a deaf and dumb child," having so often heard the tale of sorrow (unnecessary, as I believe, but nevertheless real) of parents, I do not wish to speak further than to say that with Gen. Benjamin F. Butler declaring the deaf-mute is only half a man; President Edward M. Gallaudet proclaiming deafness, always in spite of school and college education, a grave misfortune; and Dr. Alexander Graham Bell understood to be advocating measures looking to the elimination of the deaf from society, — it is no wonder that the iron enters the soul of the parent of such a child, and that he is filled with disappointment, and (I blush to write it) sometimes, as I have known, with shame. That deafness is primarily a calamity, I distinctly asserted in my article in *Science*, Oct. 31; but I am happy to know that educational skill and energy in the evening of the nineteenth century is abreast with human progress in other lines, and has immensely mitigated the misfortunes flesh is heir to, so that we are not obliged to hold on to the nomenclature of a by-gone age when we speak of the deaf, any more than we are to repudiate the railroad, the telegraph, the telephone, and cling to the old stage-coach and post-boy. No one can contemplate the present state of society without feelings of pride and gratification on many accounts, but to my mind there is no more powerful exponent of the advanced civilization of this age than is found in its educational and humanitarian measures. The education of the deaf is by no means the least of these. Indeed, it may well lay claim to the pre-eminence. Out of it have come some of the best methods of teaching that have been ingrafted upon the public-school system. It was the first of all the great humanitarian enterprises, and opened the way in the hearts of the people for that philanthropy that has reached the insane, the blind, the feeble-minded, and, it is hoped, will soon reach the epileptic. No one can too highly appreciate the change in the condition of the deaf. Others may think differently, and accordingly estimate their work. They are welcome to all the comfort resulting from their view, but I thus estimate my work. It is poor comfort to a parent to be told, that, after all that can possibly be done for his deaf child, his misfortune will be a grave misfortune still. Deliver me from further lacerating the heart already torn. It suits me far better to send a beam of hope and light into a family already invaded by foreboding, than gloom and despondency.

There is at this writing before me a letter from the mother of two deaf persons, now well settled in life, in which she says to the daughter, speaking of their early childhood and their deafness, "I thought it was an awful calamity, but I do not think so now; but, as Dr. Gillett says, in many cases I believe it has proved a blessing." This mother knows

whereof she affirms, for she has other children, now also in adult life, who hear. I sometimes wonder what must be the feelings of a refined, sensitive nature as he sees his class so unjustly represented, as if doomed to perpetual childhood, or as one without whom the world would be better off. I imagine him soliloquizing, "What kind of a being am I? The Scripture speaks of persons 'of whom the world was not worthy;' but mine is a class of persons whom some seem to deem unworthy to live, and Providence has made a mistake in giving us existence, and I will immediately set to work to help Providence do better hereafter." When criminals and paupers are exterminated, it will be time enough to take in hand honest people who are handicapped by mere physical defects. I would gladly, if I could, say to every parent that a deaf child in a family may be as cunning and lovely, and as much "a thing of beauty and a joy forever," if he is properly trained and treated, as the child who hears. Superintendents are often consulted as to the care of deaf children. Let them be careful not to make of such a consultation a quasi-coroner's inquest.

Dr. Gallaudet says the deaf will not allow me to compare their misfortune with baldness. If I have done the deaf any discourtesy by the allusion, which was not a comparison of the extent of their inconvenience, but was merely a citation of a class of persons who have a physical defect, I am willing to make due apology. Far be it from me to speak disrespectfully of the bald, whom I have held in the highest reverence since, when a child, I heard the story of the naughty boys, the bald-headed man, and the bears. I apprehended, when I made the allusion, that I should hear the growl of bears, but I did not expect that the first one would come prancing out of the office of a college president. Dr. Bell is disturbed by the qualification "in fly-time." I am willing to withdraw the "in fly-time," and leave the statement without qualification; for I believe that more suffering has resulted from insufficient head-covering in the way of catarrh, resulting in phthisis, pneumonia, la grippe, etc., than from deafness. Dr. Bell counts the cost of the deaf-mute to society; but what immense outlay has ensued from the above diseases in the way of medical attendance and supplies, and nursing, to say nothing of disorganized families, mourning and funeral expenses! Would that some scientist would organize a crusade against the intermarriage of the bald, for baldness is surely hereditary. A bald variety of the human race would be dreadful.

There is another fruitful field of benevolence open to an apostle of altruism. Carious teeth are an hereditary physical defect that has cost many times more suffering and financial outlay than deafness. Let some one anxious for the comfort of future generations expend a little energy here. I see no reason why, among the many sufferers from various physical defects, the deaf alone should be restricted in the exercise of preference in the most sacred of all human relations — the marriage relation — either by legal enactment or public opinion, which has almost the force of law. It is gratifying to know that Dr. Bell now distinctly avows that neither "he nor any one else proposes to inflict this cruelty" of legal enactment. I believe he never did; but the trend of much he has said has been in that direction, and his interviewers have been singularly unfortunate in misapprehending him. Others have advocated it, and have fortified their position by quoting statements of Dr. Bell. Dr. Bell has the tender, sympathetic heart of a humane man, and a sincere interest in the deaf, and would not intentionally wound one of them; but I am persuaded that he has caused pain that he little thought of, both to the deaf and to their relatives and friends.

Many years before Dr. Bell appeared on the arena of deaf-mute work there was in the minds of many people a prejudice against the marriage of parties in whom the liability to produce deaf offspring existed. Thirty-two years ago, being with a party of deaf-mutes in an important city of northern Illinois, I remember a prominent gentleman in active business inveighing against such persons. In vain I endeavored to show him the mistake of his view. Within the last year the same gentleman and his wife have visited me with reference to receiving as a pupil his grandson, who is now one of my pupils. Comment is unnecessary. Twenty years ago a gentleman (*sic*), overlooking a company of my pupils, after asking a number of questions, said, "Every one of their parents ought to be in the penitentiary." Such sentiments are the result of intellectual confusion. Would it not be better for scientific men who have correct information to enlighten rather than confuse the public?

Dr. Gallaudet and Dr. Bell object to my "wholesale encouragement of the intermarriage of the deaf;" one advising the marriage of the deaf with hearing persons as the ideal marriage, and the other of the congenital with the non-congenital deaf. If I have done this, I have found no reason to regret it, for there have been within my observation more deaf offspring from each of the last two classes than from the intermarriage of the congenitally deaf. My advice to them is to contract marriage just as others do, with whomsoever they find that compatibility that insures a happy marriage, as a truly felicitous union is not chiefly dependent on physical conditions, insisting only that they be sure of a competence which will insure comfort. I think the most important caution for them is to beware of undue haste. One of their inalienable rights, as of others, is the pursuit of happiness; and I know of no better way of its pursuit than in a congenial conjugal relation. I should expect, as Dr. Bell does, a larger percentage of deaf births from deaf parentage than exists in society at large; but this is not because the parents are deaf, but because they belong to families in which the tendency to deafness inheres, other members of which are as likely to have deaf offspring as the deaf themselves, and who in fact do more frequently have such children, as is shown by the far greater number of other relationships to the deaf than of parent and child. If it is improper for the deaf to marry, it is as much so for their relatives to enter wedlock. In the year 1886 I made a computation of the deaf relationships to my then present and former pupils, numbering 1,886, which showed, that, while thirteen of them had deaf parents (the parents of only one were congenitally deaf), there were 1,209 other relationships, as brothers, sisters, uncles, aunts, cousins, etc.

I am sorry that Dr. Bell (*Science*, Dec. 26) considers this question from the low plane of mercenary considerations. "Two hundred dollars a head" seems to him a terrible outlay for the deaf, while the *per capita* for hearing persons is but twenty dollars *per annum*. There is a glaring fallacy in this comparison. The two hundred dollars charged to the deaf pays for his entire instruction and support, which is done for his hearing fellows in the home, the church, the school, the mart, the shop, the social circle, the lecture, and on the play-ground. Will Dr. Bell say that all this costs the hearing youth only twenty dollars a year? I trow not. If he thinks it will, let him ask some patrons of Vassar, Wellesley, the Pennsylvania Training School, or Mount Vernon Seminary, near his home, or any other re-

spectable academy where youth are entertained and educated, and this illusion will soon be dispelled. Why one who insists that the deaf are laboring under a "very great calamity" should so unfairly misrepresent their case seems to "unreflective minds" incomprehensible. It is no answer to say that all the hearing lad receives is paid for by his friends, while the public pays for what the deaf receive, since the accumulations of the rich are all received from the public; so that whether paid for directly by the public, or through the circuition of private intermediaries, it all comes out of the public.

Dr. Bell's figuring in the same number of *Science* is a most surprising feat of mathematical gymnastics. I should be sorry to think that all of his calculations and conclusions were as baseless as this. Quoting my statement that "not two per cent of the deaf are children of deaf parents," he immediately proceeds to speak of "Dr. Gillett's two per cent," and represents me as affirming what I explicitly denied. He might as well have figured on five or ten or twenty per cent, so far as any thing I have said is concerned, and would have evolved a much more imposing Jack o' lantern. Having a false premise, his calculations are worthless even if amusing. Unfortunately, many persons seeing them over his great name will be deceived by them.

I have never named any percentage of deaf offspring from deaf parentage. I do not know what it is. My observation is too limited. I doubt if any one knows. But I am quite sure that the marriage of a few congenital deaf-mutes "with one another" is not going to inoculate the whole world with the "very great calamity" of deafness. If he deserts the question as a practical one, and treats it merely as an interesting question of scientific inquiry upon heredity, I have comparatively little interest in it. It interests me chiefly as a practical question. As such I have given it some attention for a number of years. I can only study it in the light of the facts I have, which are almost wholly among my own pupils. I think it quite probable that different conclusions would be arrived at from the study of pupils in other institutions, and that probably they would agree in no two or three groups of deaf-mutes, or of pupils of the same institution in different decades and quarter-centuries, owing to the prevalence of different diseases that cause deafness, and the variance in their virulence at different times.

Dr. Bell repeats my interrogatory, "Shut out from church privileges, as preaching of the Word, prayer-meetings, socials, receptions, lectures, concerts, parties, what remains to them of all that makes life pleasurable to us?" The question is easy of answer. There is open to them a world of beauty and grandeur, full of fragrance and loveliness, the treasures of literature and art, which they may appreciate as highly, and enjoy as intensely, as those who hear.

> "Sermons in stones,
> Books in running brooks,
> And good in every thing."

There are many needy and distressed to whom they can minister, receiving therefrom the highest satisfaction known to mortal man. Most of that which makes life noble and worth living is still attainable to them, if they improve their opportunities.

I regret that my knowledge of the past school-life of my pupils is not more complete than it is, and also that in my earlier experience I did not secure more exact statistics. Sometimes it is extremely difficult to obtain the precise information desired. Occasionally positive refusals to give it are encountered. The vital statistics gathered at institutions for the deaf are usually taken from an educational standpoint, and consequently some deaf children who lost hearing very young are classed and recorded as congenitally deaf. For educational purposes this classification is very well; but for biological and anthropological study such statistics are defective, and cause confusion. For the study of heredity they are misleading. I am persuaded that we are far from having an accurate knowledge of some of the primal causes of deafness. One quite prolific cause has been entirely overlooked, owing to the delicacy of the subject, and the difficulty of acquiring correct information in such cases. It could be appropriately discussed in a medical journal, but in a popular periodical its consideration may not be acceptable.

The cause to which I refer is psychological, and the mode of its operation is obscure. Just how mind or spirit operates on matter we do not know, but the fact is undeniable. I am quite positive, from knowledge obtained during a long period of years, that prenatal impressions are responsible for many cases of deafness which have been attributed to other causes, including heredity and family predisposition. Within my observation there have been more cases of deafness from this cause than of deaf offspring from deaf parentage.

Dr Bell inquires with reference to certain statistics I published five years ago. I am bound to admit, that, while at the time I thought them approximately correct, I have since gained additional information that somewhat changes conclusions from their study. I have had 2,158 pupils, of whom 1,580 have been discharged from the institution. No doubt a considerable number of these have contracted marriages of which I have not received information, but I have learned of the marriage of 378 of them. They were parties to 233 marriages.

Thirty-three married hearing partners. Of these, seven were congenitally deaf. Of thirty-two of these thirty-three couples, all the children could hear. Of one of these couples, the mother being congenitally deaf, two children could hear and two were born deaf.

Of thirteen couples, both parties were congenitally deaf. Of twelve of these couples, all the children could hear. Of one of these couples, two children could hear and one was born deaf.

Of fifty-one couples, one party was congenitally deaf, and one was adventitiously deaf. Of these fifty-one couples, one couple had one hearing and four adventitiously deaf children; one couple had one hearing and one adventitiously deaf child; three couples had one congenitally deaf child; one couple had two congenitally deaf children.

Of twenty-five couples, both parties were adventitiously deaf. Of twenty-three of these couples, all the children could hear; of one of these couples, one child could hear and one is congenitally deaf; of one of these couples, four children hear and one is adventitiously deaf.

But I have had other pupils whose parents, though deaf, were educated elsewhere. Two sisters born deaf were children of a deaf father and hearing mother. Two brothers — one congenitally and one adventitiously deaf — were the children of deaf parents; but whether the parents were congenitally or adventitiously deaf, I have been unable to learn. One boy was adventitiously deaf whose father was deaf, but of whose mother I have no information.

The foregoing may be tabulated as follows: —

PARENTS.	OFFSPRING.	
	Congenitally Deaf.	Adventitiously Deaf.
Both parents congenitally deaf.....	1	
One parent congenitally and one adventitiously deaf.....	5	5
One parent adventitiously deaf, one hearing.....	2	
Both parents adventitiously deaf.....	1	1
One parent hearing and one congenitally deaf.....	2	
Both parents deaf, but whether congenitally or non-congenitally unknown.	1	1
Father deaf, but whether congenitally unknown, but of mother no knowledge.....		1

Applying the above to the classification recommended by Dr Bell and approved by Dr. Gallaudet (*Science*, Nov. 28, 1890, p. 295), while it is difficult to decide as to which class some of them should be assigned, I should say that it appears as follows: in Class 1, two; in Class 2, twelve; in Class 3, five; and in Class 4, one.

Let the reader consider the above table, which comprises twenty deaf-mutes, three of whom were never among my pupils (thus leaving seventeen), and remember that it shows the deaf parentage of 2,158 deaf-mutes, and observe that only one of them is the child of parents both of whom were congenitally deaf, that ten are the children of parents one congenitally and one adventitiously deaf, and two the children of one hearing and one congenitally deaf parent, and ask who is advising the promotion of "a deaf variety of the human race." It is not the subscriber. I find no two per cent in this.

"Master, who did sin, this man, or his parents, that he was born" deaf? "Jesus answered, Neither has this man sinned nor his parents." PHILIP G. GILLETT.

INDIAN PRESERVES.[1]

THE demand for Indian preserves and jams has greatly increased during the past few years. In India, preserves and jellies are made of the pear, quince, mango, tamarind, date, banana, guava, and other fruits. In Singapore, pineapples are preserved whole; and in the Bahamas the manufacture is also carried on, on a large scale, to the extent of nearly 1,000,000 cans annually. Each can of fruit, before the sirup is added, weighs two pounds. From 12,000 to 14,000 can be filled in a day; and 25,000 pines are usually consumed daily during the season. In Singapore much enterprise has been shown in preserving tropical fruits. There are two or three firms who deal largely in them.

The Indian preserves were formerly much in request. Thus, in the thirteenth century the most renowned preserve was a paste made of candied ginger. Among other fruits, etc., preserved in their natural state, in sirup, crystallized with sugar, or made into jelly, are the pineapple, bread-fruit, ginger, jack-fruit, the papaw, mangosteen, pomeloe, guava, and nutmeg. Although in flavor and preparation these preserves may not equal those of Europe, they make an agreeable change.

The pineapple is one of the best of tropical fruits, although it is produced of a superior quality by European cultivators. Its sweet and acid flavor, and pleasant aroma, make it sought after by consumers of all classes. One house in Singapore ships about 70,000 tins of this fruit. Pineapple marmalade (thought by some to be the most delicious preserve in the world) might also be sold at ten cents per pound in London.

There are two species of guava fruit — the red guava; and the white, or Peruvian, guava. Both make excellent sweetmeat paste or jelly, which is very pleasant and nutritious, from its superior power of assimilation with the gastric juice, and perfect development of saccharine.

It is said that a hundred different preserves could be made from a judicious blending of the fruits of the East and West Indies and South America.

The jamun (*Syzygium jambolanum*), a sort of long, dark purple plum the size of a large date, makes excellent preserves, and has exactly the flavor of black-currant jelly, to simulate which large quantities are sent from India to England. It is also used for flavoring other jams.

The fruits of *Inocarpus edulis* are preserved in the Indian Archipelago. A sweet conserve is made in India of the fruits of *Terminalia Chebula*. Another is made of the fruits of *Phyllanthus distichus*, at Birbhum in Bengal. The acid calyces of the rosella (*Hibiscus sabdariffa*) are converted into an excellent jelly, which would be highly appreciated in England, if once introduced. Jam and jelly are made in Canada from the fruit of *Shepherdia argentea*.

The fruit of *Spondias*, not unlike a cherry, is made into jelly. The scarlet fruit of the quandong (*Fusanus acuminatus*), the size of a small peach, makes an excellent preserve for tarts in Australia.

The tamarind plum (*Dialium indum*) of Java has a pod filled with a delicate, agreeable pulp, much less acid than the tamarind. The golden drupes of *Spondias cytherea*, or *dulcis*, a native of the Society Islands, are compared, for flavor and fragrance, to the pineapple. The large acid fruits of the kai apple (*Aberia caffra*) of Natal can be converted into a good preserve of the red-currant jelly class. The fruit of *Cornea speciosa* is delicious: it is called "mangaba" by the Brazilians, and when ripe is brought in great quantities to Pernambuco for sale.

The fruit of the goumi, of Japan (*Elæagnus edulis*), makes excellent preserves, fruit sirups, and tarts. The berries of *Pyrus aucuparia* and of *P. baccata* are made into comfits, conserves, and *compôtes*. The fruits of *Astrocarpum ayri*, of Brazil, are made into an excellent preserve, which is much esteemed in that country.

The fruit of the Chinese quince (*Diospyros amara*) is converted into sweetmeats, of which the Chinese are exceedingly fond.

The bread-fruit, in sirup or crystallized, may please native palates, but it is not likely to find favor in Europe, being flavorless, and more of a food-substance than a fruit.

Preserved ginger is popular in England, but is not much esteemed on the continent. The Spaniards eat raw ginger in the morning, to give them an appetite; and it is used at table fresh or candied. Among sailors it is considered antiscorbutic. The quantity of preserved ginger imported ranges annually from 1,500 to 2,500 hundredweight, value about $17,500 to $21,500. It forms the bulk of the succades received from the Chinese Empire, 18,000 to 20,000 hundredweight coming from Hong-Kong. Some ginger is also received from India. The mode of preparing it in the East is as follows: The racemes are steeped in vats of water for four days, changing the water once. After being taken out, spread on a table, and well pricked or pierced with bodkins, they are boiled in a copper caldron. They are then steeped for two days and nights in a vat with a mixture of water and rice-flour. After this they are washed with a solution of shell lime in a trough, then boiled with an equal weight of sugar, and a little white of egg is added to clarify. The ginger, candied or dried in sugar, is shipped in small squares of zinc. That preserved in sirup is sent out in jars of glazed porcelain of six and three pounds, and packed in cases of six jars. The quality called "mandarin" is put up in barrels.

The papaw (*Carica papaya*) is a fleshy, pulpy fruit, of an orange color, sweet and refreshing, which is eaten as the melon is in Europe. This fruit, however, in sirup or crystallized, has very much the taste of a turnip.

The mangosteen is a fruit about the size of a mandarin orange,

[1] From the Journal of the Society of Arts, London.

of a sweet flavor, accompanied with a slight acidity, and an odor resembling the raspberry. It is the produce of *Garcinia mangostana*, and is one of the most delicious and famous of the fruits of the Indian Archipelago, ranking with the pineapple. Presents of baskets of it are sent from Singapore to India and China. It is a pleasant fruit, with a delicate but characteristic flavor, partaking of the strawberry, grape, pineapple, and peach. The happy mixture of tart and sweet in the pulp renders it no less salutary than pleasant; and it is the only fruit which sick people are allowed to eat without scruple. In Cochin China they sell at from a dollar to a dollar and a quarter the hundred.

The pomalo (*Citrus decumana*) is a large fruit of the orange family, with an acid flavor, frequently bitter. The pulp and thick rind, crystallized with sugar, are eatable, but lose much of their natural flavor. It it better known as the shaddock, and the fruit will exceptionally attain a weight of twenty pounds.

The mammea apple (*Mammea Americana*) is abundant in the West Indies. The pulp is of a sweet aromatic smell, and of a peculiar yet delicious flavor. It is sometimes sliced, and eaten with sugar or wine, and also makes a very good jam by being preserved in sugar. Another tropical fruit, the *Mammea sapota*, is known as American marmalade, from the similarity of the flavor of the pulp to the marmalade made from quinces.

The succulent fruits of *Cicca disticha* have an acid, sweet flavor, and are eaten cooked or made into preserve.

The green, fleshy, gratefully acid fruits of *Averrhoa bilimbe* and *A. carambola* are preserved, and used for tarts and for flavoring various dishes.

An excellent preserve is made from the sweet peel and acid pulp of the comquat or kumquat (*Citrus japonica*), a curious, small, nutmeg-shaped orange in China and Japan.

The red berries of *Carissa carandas* furnish a well-known substitute for red-currant jelly, in India and China.

The Peruvian cherimoyer (*Anona cherimolia*) is a highly esteemed succulent fruit, of a most luscious flavor, containing a soft, sweet mucilage resembling strawberries and cream. It is often called the "queen of fruits."

The mango, the mangosteen, the custard-apple, and the durian are known by repute only to the people of this country; but, while they might easily be frozen and brought here in admirable condition,—dishes fit for the gods,—no attempt is made to utilize these luscious fruits of India in their fresh state, nor is very much done in preserving them.

The durian (*Durio zibethinus*), although it has a strong offensive smell, is eaten greedily by the Burmese, and as many as 40,000 are annually sent to Upper Burmah.

The mango (*Mangifera indica*) is the best fruit in India, as highly valued as the peach with us, and forms a considerable portion of the food of large classes of the native inhabitants. The varieties cultivated are about as numerous as are those of the apple. An Indian gentleman has made colored illustrations of more than two hundred varieties of this fruit. The quality is difficult to judge of from external appearance. There are large and small, elongated and abbreviated, bright orange-colored and green. They vary much in taste, some being of the flavor of honey, some of pineapple, some of orange, while others have distinct flavors of their own. A good mango should be as little stringy as possible, and should not have too much of the turpentine flavor towards where it is attached to the foot-stalk: a moderately aromatic savor there is by no means objectionable.

The young unripe fruits are largely consumed in India in tarts, etc., and mango-fool there takes the place of gooseberry-fool. The half-ripe fruits are also made into a marmalade which resembles much that of apples.

So large is the consumption of this fruit in India, that wagon-loads, bringing collectively twenty tons of the fruit, have entered the Island of Bombay in a single day. The fruit of the finest mangoes have a rich, sweet-perfumed flavor, accompanied by a grateful acidity.

The thick juice is by the natives of India squeezed out, spread on plates, and allowed to dry, in order to form the thin cakes known as amsatta. The green fruit is sliced and cooked in curry; is made into pickle with salt, mustard, oil, and chillies; and also into preserves and jams by being boiled and cooked in sirup. Some varieties of mango have fruits as big as an infant's head, ovate, with a golden skin, speckled with carmine, and a green-gage flavor.

The finest varieties of this almost unequalled fruit seem to thrive in Jamaica, where it was introduced about a century ago as well as in Bombay. It is the popular fruit there with the negroes.

The Siam mango is a tolerable kind, which sometimes grows to one pound weight. The egg-mango is a small, yellow kind, with too much of the turpentine-flavor, and too acidulous to be much prized. The horse-mango is a very coarse fruit of unpleasant odor, much eaten by the lower classes, and producing cholera, diarrhœa, and dysentery. The Bombay mango, termed "Parsee," is known for its lusciousness and delicacy of flavor, the absence of fibre, firmness of flesh, thinness of skin, and small size of the stone. It must, however, be admitted that on tasting this delicious fruit for the first time, a slight turpentine flavor is experienced.

A raw guava, or even a raw mango, may not be, to every Englishman's palate, a satisfactory exchange for a mellow pear or a juicy peach, but preserved mango and guava jelly are things by no means to be despised. Some of these preserved foreign fruits are delicacies only to be obtained at some of the best West-end houses, at prices too high for ordinary consumers; but if large quantities were sent into the market, and the prices consequently lowered, the demand would become greater, and the sale more profitable, and would probably lead to the introduction of new articles, to the mutual benefit both of ourselves and the growers and preservers of the fruits.

Mango jam is prepared by boiling the mango in sirup, after removing the skins and stones, and the sour juice squeezed out by the free use of forks, and soaking in fresh water. Two pounds of mango to one ponnd of sugar is the proportion in which it is prepared.

Bilimbi jam is made by removing nearly three-fourths of the juice of the fruits of *Averthoa bilimbi*, and soaking in water, squeezing the fruit and boiling them in sirup. Nelli jam, from the fruit of *Phyllanthus embelica*, is made in the same manner, proportion of fruit and sugar same as mango.

From Natal there have been shown at the various exhibitions amatungula jam, the produce of the fruit of *Arduina grandiflora*, sometimes called the Natal plum. This jam is firm, nearly like that of the quince, and has a rough acid flavor, but is a curious and agreeable preserve.

The gooseberry jelly from there is the produce of *Physalis pubescens*. It is pleasantly sharp, without having the rough, metal-like acid of the amatungula. The guava jelly has the full taste of the West-Indian preserve. The pineapple jam has the rich, almost too luscious taste for which the Natal pines are famed. The loquat is a very sweet and fine preserve, slightly resembling quince marmalade, but with less pronounced individual flavor. The fruit is very delicious in its unpreserved ripe state, having the flavor of an apple grafted upon the flesh of the melting peach, with large apple-pips taking the place of the stone, and ripening in massive bunches. Like the peach, the fruit is almost too delicate for a preserve. Its most refined and exquisite qualities do not survive the bath of boiling sugar. The rosella is the preserved fruits or calyces of the *Hibiscus sabdariffa*, which makes a most estimable substitute for red-currant jelly, particularly relished in hot climates. The grenadilla, the purple fruit of a passion-flower (*Passiflora edulis*), is almost without a rival for delicate fragrance and perfume, has a sweetish acid taste, and makes an excellent preserve. The St. Helena peach resembles, in the preserved state, a very excellent yellow plum. The shaddock marmalade might also be spoken of as a worthy substitute for the Seville orange marmalade.

Nature says that the Russian painter Krilof is painting the portraits of typical representatives of the various races included in the Russian Empire. In carrying out his purpose, he has undertaken many long journeys; and he has now a small gallery which ought to be of considerable value from an anthropological as well as from an artistic point of view.

SCIENCE.

A WEEKLY NEWSPAPER OF ALL THE ARTS AND SCIENCES

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Communications will be welcomed from any quarter. Abstracts of scientific papers are solicited, and twenty copies of the issue containing such will be mailed the author on request in advance. Rejected manuscripts will be returned to the authors only when the requisite amount of postage accompanies the manuscript. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a guaranty of good faith. We do not hold ourselves responsible for any view or opinions expressed in the communications of our correspondents.

Attention is called to the "Wants" column. All are invited to use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

A BOSTON "ZOO."[1]

IT is a little strange that a zoölogical garden should be so rare a sight in our country, or, if found, should be so poorly equipped, when there is hardly a European city of any size without one, which is invariably a centre of attraction for all American visitors. We often hear the inquiry, "Why cannot we, too, have a 'zoo'?" and we all know that such a garden in Boston has long been talked of. Indeed, it has been seriously studied for a number of years by our naturalists; but a brief consideration will show that to found and sustain an establishment of the first class, modelled on the best in Europe, would involve an expense very much greater than there, simply from the fact that in no place in Europe where a flourishing and extensive garden exists, are the winters nearly so long or so severe, nor are they accompanied by such abrupt terminations, as here: our winters, in short, would entail a vastly increased expense to keep tropical creatures in health, and presentable to the visitor.

But this is by no means the only difficulty we labor under in Boston: for two things are absolutely essential to an undertaking of this sort, — first, sufficient space; and, second, its accessibility to the public. Now, where are we to look for an unencumbered spot of ground sufficiently extensive for these purposes reasonably near the heart of our city?

The acreage of the gardens in Europe ranges from about half a dozen to half a hundred acres, but hardly one of them has room enough for its animals. The Zoölogical Garden of London, the best and most successful of all, is very crowded, and does not appear to cover more than thirty-five acres, so far as can be told by measurement from a map. Forty acres — somewhat less than Boston Common — is the least we ought to count on here; but we have barely saved for ourselves on the outskirts of the city room for public parks.

The "scientific" and the "practical" man are often set in antithesis. Will you kindly give your attention for a few minutes while I endeavor to show that they may also be named synthetically, by pointing out how the scientific men try to answer a practical question and resolve practical difficulties?

We who have had this matter before us have been on the watch for opportunities long enough to see an immense growth in our city and a rapid occupation of our suburbs. We have seen one spot after another which we had looked upon with envious eyes fall into the hands of the land speculator, until the chances seemed to grow less as the needs appeared greater. But our opportunity at last came with the establishment of the Park Commission, without whose hearty support we should be silent to-night.

The only piece of ground under the control of the park commissioners large enough to have a portion of it set apart for a general zoölogical garden is Franklin Park in the Jamaica Plain district: but there are two insuperable objections to the use of this cite, — first, that it contains no sufficient body of running water for the needs of aquatic animals; and, second, that the segregation of a sufficient territory would absolutely prevent the use of this large section as a country park, one of the most important of the designs of the commissioners, and not elsewhere attainable. The only possible escape from this dilemma is one which, while it certainly involves an additional expense, brings with it compensating advantages. It is the division of the proposed Natural History Gardens into separated sections. The disadvantages of this plan are the extra expense of fencing, and of gate-keepers and superintendence, and that we should have to go to widely distant points to see all that there is to be seen. The advantages are the better selection of sites for special groups of animals, and the important fact that some one of the exhibits would be easily accessible to every inhabitant of the city.

For the purposes of a natural-history garden, — we use this word as more correct than the more limited but more usual one of zoölogical garden, — animals and plants may be divided into those inhabiting the salt water or dependent upon it for means of sustenance, those inhabiting the fresh water or so dependent, and land animals properly speaking. All air animals would find food and shelter within or upon one or other of these media, and therefore we need not consider them as a group apart. One grand factor in life here presents itself, by taking advantage of which we may impress it upon every visitor to our gardens by compelling him, if he would learn all we offer, to pass at some expense of time and labor from one of our exhibits to another. It is our first essay in teaching one of the fundamental facts of nature.

The sympathetic concurrence of the park commissioners enables us to carry out, it has indeed originated, this idea, since they offer us three separate tracts, — one upon the seashore, one which includes a pond of moderate extent and the valley of a small stream, and the third a very attractive bit of rocky woodland and glade. Not one of these spots is all that could be desired for the purposes in view, but they are the very best the park commissioners have to offer; they are the best unoccupied grounds left about Boston; and they cover the two requisites mentioned at the start, — suitable room and sufficient for all reasonable purposes, within easy reach of the people.

Observe for a moment their position on this map of Boston. The Marine Garden, or Marine Aquarium, as we call it, will be situated at that point where Boston stretches its farthest hand to the sea, in the so-called Marine Park, already in its half-finished state thronged by thousands, especially in the summer, and which is more easily reached than

[1] Remarks made at a meeting of the Thursday Club, Boston, Jan. 15, by Samuel H. Scudder.

most of us imagine by the horse-car, soon, no doubt, to be supplanted by the electric railway.

Diametrically opposite, in the near suburbs, is Jamaica Pond. The park grounds almost touch its northern margin; and separated from it only by the highway and the steep banks on either side is Ward's Pond, well known to skaters, and the head waters of a stream with the uninviting name of Muddy River. It is close to the heart of Brookline, Boylston, and Jamaica Plain, and here it is proposed to plant the Fresh Water Aquarium.

Also near to Jamaica Plain, and barely at the outer edge of the multiplying streets and thickly settled districts, on the city side of Franklin Park, reached from the heart of the city itself by two lines of electric cars and one line of steam-cars, hardly more than across the road from one of Boston's crowded resorts for pleasure, is the third reservation, the largest tract of all, known as the Long Crouch Woods, destined for the display of land animals.

But now we meet one of the necessary limitations already alluded to. Marine and fresh-water animals are usually exhibited in series of aquaria and tanks in buildings, which manifestly need but little space. Land animals, on the contrary, especially the larger sort, require a great deal of room; and just here comes in the question of the housing and proper exhibition of tropical beasts. We do not wish to show them in cages, as in a stranded circus. Whatever is exhibited should be shown in circumstances and amid surroundings as nearly natural as possible, and cleanliness is an important condition.

Now, the space at command at this end of Franklin Park — about twenty acres — will in no way permit the suitable and satisfactory display of the numerous hordes of tropical animals; and the enormous expense attendant upon their winter housing in such a climate as ours altogether forbids such an undertaking now; our people are not yet eager enough for such shows to give them financial support; it may be that by and by we shall find that our present plan has outgrown our most sanguine expectations, and be able to secure some cheap waste land not far removed (say the salt marshes north or south of Boston), on which such a general garden could be built up by slow degrees. Such a scheme we may leave to those who come after us. For us, we must dismiss such fond dreams as immediately chimerical, and ask ourselves what we *may* have, what limits we should assign ourselves and yet be satisfied.

When we remember that not one in ten thousand, perhaps not one in fifty thousand, of our city people (not only here in Boston, but anywhere), has ever seen or is in any way familiar with the greater part of the animals and plants that are indigenous to the soil on which he was born and bred; when we further notice, what I believe is the fact, that not a single collection of living animals in the world has ever been made, either separately or in connection with a larger display, to show the native animals of the region where they are exhibited, although natural-history museums of dead nature very often offer this attraction, — we see at once that we have here an opportunity of setting an example to the world, sure to be followed, to the gain of general education everywhere. The advantages and the interest of such an exhibition are plain; more than that, these creatures are the very ones which need least protection and expense, so that the plan is doubly feasible. The only question is, How wide a scope shall we give to the term "indigenous"? What territory shall we draw upon? This we may well leave to future experiment, but we should wish at least to show the animals and plants of a zone across our continent within the latitude of New England. The New England indigenes would then always form the bulk of the collection, and we should have in fact, as well as in name, a New England garden. This fact, this name, would have its value and its significance; and elephants and giraffes, camels and tigers, would not be expected, and the travelling menagerie and the Fall of Babylon be deprived of no monopoly.

The garden thus becomes educational: it teaches as a whole the lesson of our surroundings; it impresses the fact that the range of animals is circumscribed within definite areas, however large. It *should* teach more: it should give some hint, at least, of a wider outlook; it should show how, as we pass beyond the range of our own indigenes, these are replaced by others; it should hint how far we need to go to find this out and the nature of the change. Side by side, then, with our native animals, if we would enlarge the horizon, must we show their kin, even if we go beyond the seas. Such a collection must be limited, to be most instructive. It is now the aim, in the best museums of natural history conducted for educational purposes, to concentrate the attention upon relatively few objects, rather than confuse the mind with the bountiful prodigality of nature. Side by side with our black and grisly bears we might show the brown bear of Europe and the polar bear, and stop there; as a companion to the opossum, we should look to the home of the marsupials and choose the kangaroo—no need of more; for our larger variety of smaller quadrupeds, our squirrels, moles, mice, and bats, and we may also say for our horned ruminants and our cats, not even so much extra-limital material would be necessary: so that, though some of the missing types should also find a place, such as a sloth, an ornithorhynchus, or a monkey, the draught on tropical animals would be exceedingly small, and need not be felt as a matter of concern.

I have instanced here only a few among the quadrupeds. There is no need of enlarging: the story would be the same with the birds, reptiles, and other animals. Such a collection would be of unique interest and attraction; its installation in Long Crouch Woods would be all that could be desired; and it would be easy to add such features to the garden as would make it equally attractive at all seasons. Thus it is not impossible that special exhibits might be made of birds of passage, during the period of their migrations. A winter garden under glass has been suggested, which might well become one of the chief resorts of the people by day or evening, where in a temperate atmosphere, with a varied and soft foliage everywhere, they would find pleasure and profit in looking at flowers and birds, fountains and brooks, and in learning the habits of curious strange creatures at their play.

If I have dwelt on this division of the Natural History Gardens longer than I should, it has been mainly to show how the very limitations to which the scheme is subject have been made to serve a useful purpose. It is not possible, however, that this part of the plan should be brought to successful issue at once. The division of the gardens allows the opening of one section at a time, — a very important consideration, — and this section, as certainly the most expensive, will of course come later. Let us, then, pass for a brief time to the neighboring department, that of the Fresh Water Aquarium at Ward's Pond.

The spot is a sheltered one, protected by encircling hills, most favorable for our purpose. Here will be relegated not only the animals and plants inhabiting fresh water, but

also those which live in or upon its banks; and as the space here seems to be ample,— the ground covers about fourteen acres,— expense would be the only limit; so that, should the returns warrant, we may eventually include not a few subtropical or even tropical animals. The stream will be so turned as to run in winding channels through pond-like enlargements, much increasing the opportunity for the outdoor display of water-fowl and beast. Here will find their place fish-hatcheries where the processes of growth may be observed, and insectaries in which the changes which many creatures undergo in passing from an aquatic to an aerial life will be readily seen. So other significant transformations may be observed in displays which will show how readily certain brine shrimps may change their actual structure to become in a few generations fresh-water shrimps, and illustrate the rarely considered fact that all fresh-water organisms are modified descendants either of marine, or, by retrograde movement, of terrestrial, animals or plants. The broad relations of our three realms of life will thus be indicated. Here, too, will be fine opportunities for the growth of water-plants, both of the temperate zones and of the tropics; for, with proper care, even the wonderful *Victoria regia* can be grown in full beauty.

Many of these things will be seen, of course, under cover, where, in the inclement season, all creatures which live beneath the surface of the water must be housed. Houses must also be fitted for the protection as well as display of all foreign creatures, so that in winter and summer alike this section of the garden shall have its full share of attractions.

But the place of highest interest and usefulness is that which we wish first to undertake, the Marine Aquarium at City Point,— greatest, because of the larger variety of form, of structure, and of color among marine animals ; because, too, some of the most beautiful and most surprising of these creatures are inhabitants of our own seas, but are almost wholly unknown except to naturalists. When the display of the animals of our own waters in all their vivid coloring, lovely or grotesque form, and varied action, is ready, thousands will marvel at the revelation of a new world of their own of which they have not dreamed.

The ground here allotted, covering about eight acres, will be ready for occupation the coming summer, and will have as its chief attraction a building for aquaria, so arranged that almost the only light which enters the halls will be that which passes through the aquaria; and we may thus watch the creatures much as if we were ourselves beneath the sea, without those features which might make such a position disagreeable. The first room to visit, however, would be one devoted to an exposition of the relations of animals and plants to their surroundings, such as would give a clew to much we should afterwards see which would be otherwise obscure. Not only would the differences between the great groups of animals and plants be made clear by proper preparations and other exhibits, but a distinct effort would here be made to show what definite relations the structure of animals bears to their immediate surroundings and to their habits, and how animals are provided with the means to do the precise work they have to perform, for work is a condition of being. The changes that have taken place in the structure of certain descendants of air-breathing land animals, such as whales, in order to fit them for marine life, would be illustrated, and other fundamental laws of organic modification would be made clear by aids known to the expert. A similar introduction would be offered in the other sections of the gardens, modified to suit the immediate situation and multiply the illustration, so that the full value of each exhibit might be attainable on the spot.

In the general exhibition-rooms the individual aquaria are like the cases in a museum : their position or their contents may be altered or shifted at will to illustrate this or that feature. But it is probable that geographical data will always have a large influence on the juxtaposition and distribution of the inhabitants of the tanks, first, because it is possible and desirable to have many sorts — widely differing sorts of animals which do not come into collision — in a single vessel, but also because of the importance which relative depth in the ocean, as well as latitude and longitude, has upon marine life. Our own marine fauna and flora would be displayed by itself in special series of aquaria; while, as every desirable range of temperature would be possible in the different tanks by simply heating or chilling the inflow, or, by convection, the water in the vessel itself, tropical and arctic animals, once obtained, could be kept throughout the year.

Outside in the grounds large and small salt-water basins are planned, within which it is hoped to confine and exhibit some of our smaller cetaceans, porpoises, dolphins, etc., as also seals ; while upon their shores and islands water-fowl and other creatures would disport themselves. It may even be practicable by some device to create, in a basin of smaller extent, an artificial tide, with high water at noon and at midnight by the clock, so that the intertidal animals may find their place, the nimble "peep" scamper in flocks along the beach (their wings clipped, of course), while the margins shall represent at intervals a rocky and a sandy shore. This bit of marine life transplanted to our homes need not end here: we should reproduce also the vegetation of the immediate coast ; even the beach-grass of New England may find its corner and give its lesson, offering shelter and congenial home to the maritime locust, whose complete protection through its colorational resemblance to the sand it dwells upon would give to every one who sought it out a practical lesson in one of Nature's most hidden laws,— the importance of disguise and mimicry.

The finest existing zoölogical garden is controlled by a strictly scientific association, — the Zoölogical Society of London. It remains to be seen whether our Society of Natural History cannot accomplish in America a similar work. We may not be able to rival our transatlantic brethren in the extent of our menagerie,— here we are handicapped by the lack of colonial possessions,— but the wide extent of our country gives us altogether the advantage in a display of native animals ; and, if we rightly seize the opportunity before us, we may have a series of gardens second in educational value and in public interest to none in the world.

MEN WHO ARE WORKING WITH KOCH.

PROFESSOR KARL FRAENKEL, whose highly important experiments with a view to conferring immunity against diphtheria are now one of the chief topics of discussion in the medical world, is a pupil of Robert Koch. According to the *Lancet*, he passed his final examination as a physician in 1885, was appointed assistant in the Hygienic Institute, Berlin, on its establishment, and soon became Koch's first assistant there. In 1887 he established himself as private lecturer in Berlin University. About a year ago he was appointed professor of hygiene at Königsberg. He became generally known in medical circles by the publication of his "Elements of Bacteriology," in 1886. This book has appeared in a third edition, and has the reputation of being the best of its kind. The most important of Fraenkel's special in-

vestigations are those of bacterial poisons, which he made in common with Ludwig Brieger. They led to the discovery of toxalbumin, and to that above mentioned. His other discoveries are those concerning the bacterial contents of ice, the cultivation of bacteria which thrive without air, the occurrence of microorganisms in the various layers of the soil, etc.

Dr. Kitasato, a Japanese by birth, has lived in Germany for five years, and has occupied himself almost all the time with bacteriological studies in the Hygienic Institute. The biology of the cholera bacillus has been the theme of many of his researches. He has investigated its behavior in milk and in fæces, and its relations to other pathogenic and non-pathogenic bacteria in nutritive solutions. He has also gone deeply into the study of the tetanus germs, and has now published the results of his investigations in his article on immunity. One of his chief discoveries is that of the musk fungus.

Dr. Ernst Behring, who has shown, in conjunction with Dr. Kitasato, how immunity against diphtheria and tetanus is conferred on animals, is an army surgeon, and has been working as an assistant for about a year and a half past in the Hygienic Institute. Among his first studies after he became a surgeon, ten years ago, was the manner in which antiseptic remedies for wounds, especially iodoform, act, and he made a special study of the symptoms of iodoform poisoning. He afterward tested the antiseptic value of silver solutions, creoline, and other chemicals. Cadaverine, the etiology of anthrax, and the immunity of rats, are also among the themes to which he has devoted special attention, but diphtheria has recently been his exclusive study.

HEALTH MATTERS.

Action of Living Blood on Bacteria.

PROFESSOR BONOME has recorded the results of his researches on the following points: whether physiological alterations in the blood play any part in modifying its destructive action on bacteria; whether it is possible to produce alterations in the composition of the blood of such a nature that the normal inimical action against bacteria may be altered; and whether it is possible to derive any reliable data that will throw light on the subject of immunity. As a result of his experiments, he comes to the conclusion that staphylococci introduced directly into the blood are destroyed in from ten to twenty-five minutes, more rapidly in the blood of young rabbits than in older animals of the same species (*British Medical Journal*). He then, by injecting the poison obtained from the pus of an old empyema or a chronic abscess in small quantities into healthy rabbits, proved that the bacteria-destroying activity of the blood is increased, the organisms used being staphylococcus aureus, albus, and citreus. He holds, however, that the introduction of such poison does not appear to exert any influence upon the similar activity of the fixed tissues. Poison from acute pus obtained in a similar manner appears to exert not the slightest influence on the destructive action of the blood; while, owing to its effect upon the tissue-elements, it diminishes their power of destroying such organisms as the staphylococci above mentioned. Similar poison from pyogenic staphylococcus culture does not increase this destructive power of the blood against the above-mentioned organisms; and any immunity that is produced depends, not on the rapidity and certainty with which the blood destroys the organisms introduced into its stream, but rather upon a greater resistance which the tissue-elements exert against the bacteria poison, when they have become accustomed to the action of the poison by remaining in contact with the metabolic products of the same bacteria. He also gives experiments to show that water injected into the veins can diminish this destructive activity of the blood to a certain extent, but never completely; for although the animals so injected, and control animals, died about the same time, those in which water had been injected usually showed small purulent deposits in the kidneys and myocardium, and more or less fatty degeneration of the epithelium of the kidneys: so that he considers, that, in addition to this slight diminution in the destructive activity of the blood, there is some alteration of the protoplasm of the cells, probably due to the absence of salts and the cutting-off of the full oxygen supply by the presence of water, by which their resistance is considerably diminished in certain areas, and owing to which they are more readily attacked by the injected staphylococci.

Amount of Sugar in Blood in Disease.

Dr. N. P. Trinkler recently read, before the Kharkoff Medical Society, a paper on the "Diagnostic Significance of the Quantity of Sugar and Reducing Substances in the Blood," in which he detailed a number of observations he had carried out on patients in Professor Grube's surgical clinic, the majority of whom were suffering from cancer (*The Lancet*). The blood of some, as described in the *Medical Record* of Jan. 3, was taken for examination during an operation, that of the rest being only obtained after death. The examination was in all cases made by means of two processes, — that of Fehling and Soxhlet, and that of Knapp (Knapp's solution consists of cyanide of mercury dissolved in caustic alkali),— the mean of the two results being taken. He found that the blood during life always contains less sugar than after death, and that that of persons suffering from cancer contains a larger proportion of sugar and reducing substances than that of healthy persons, or of persons suffering from other diseases. Affections of internal organs appeared to be accompanied by a greater percentage of sugar in the blood than diseases of the skin or of external parts. The degree of emaciation produced by cancer did not seem to have any direct effect upon the quantity of sugar in the blood. There did not seem to be any real correspondence between the amounts of sugar and other reducing substances: the sugar was much more constant in its amount, the quantity of the other reducing substances being liable to very considerable variations. In the observations made on various diseased conditions, the following were the amounts of sugar found: cancer, 0.1678 per cent to 0.2037 per cent; typhoid-fever, 0.0950 per cent; pneumonia, 0.0943 per cent; dysentery, 0.0838 per cent; organic diseases of the heart, 0.0737 per cent; peritonitis, 0.701 per cent; phthisis, 0.0653 per cent; syphilis, 0.0553 per cent; nephritis, 0.0489 per cent; hæmaturia, 0.0375 per cent.

A Surgical Use for Ants

Ants have very powerful jaws, considering the size of their bodies, and therefore their method of fighting is by biting. They will bite one another, and hold on with a wonderful grip of the jaws, even after their legs have been bitten off by other ants. Sometimes six or eight ants will be clinging with a death-grip to one another, making a peculiar spectacle, some with a leg gone, and some with half the body gone. One singular fact is, as we learn from the *Medical Record*, that the grip of an ant's jaw is retained even after the body has been bitten off and nothing but the head remains. This knowledge is possessed by a certain tribe of Indians in Brazil, who put the ants to a very peculiar use. When an Indian gets a gash cut in his hand, instead of having his hand sewed together, as physicians do in this country, he procures five or six large black ants, and, holding their heads near the gash, they bring their jaws together in biting the flesh, and thus pull the two sides of the gash together. Then the Indian pinches off the bodies of the ants, and leaves their heads clinging to the gash, which is held together until the gash is perfectly healed.

The Cradle of Influenza.

Professor Tessier, of the medical faculty of Lyons, has returned from Russia, whither he was sent last March to take evidence upon the course of influenza there, and the various conditions of its evolution. He found, according to the *Medical Record*, that influenza is a growth of Russian soil, and, when not a raging malady, is a smouldering one. The way the people live in winter, locked up in heated houses; the flatness of the soil, its consequent bad drainage, and universally sodden condition when the April thaw begins; the filthiness of the farm-yards, the village streets, and the rivers, which become suddenly swollen, and on falling leave a putrid mud behind,— all conduce to make influenza endemic. Its microbe is, in fact, to be found in this mud. Dr. Tessier calls it a strepto bacillus. What is peculiar in this dis-

ease is the alliance with this bacillus of pneumococcus, which also lives in Russian marshes, river-mud, and village pools.

Hunger and Infection.

It is a well-known fact, says the *Medical Press*, that hunger predisposes to certain diseases, but it has been reserved to two Turin doctors to demonstrate the increased liability experimentally. Their observations were carried out with the virus of bacillus anthrax on pigeons,—a disease to which these birds are, under ordinary circumstances, refractory. They found, however, that six days' total deprivation of food rendered the birds amenable to the virus, on condition that food was still withheld. If, however, food was given at the same time as the virus, then they still successfully resisted infection. Further, when starvation was continued for two days after the inoculation, and food then given, the development of the disease, though not prevented, ran a slower course. Lastly, the virus proved capable of infecting birds well fed up to the date of inoculation, but starved subsequently. The line of investigation is evidently one which admits of further research, but the moral is obvious.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

The editor will be glad to publish any queries consonant with the character of the journal.

On request, twenty copies of the number containing his communication will be furnished free to any correspondent.

Cyclones and Areas of High Pressure.

IN his communication to *Science* of Jan. 16, Professor Ferrel speaks of my storming a camp in which he was not to be found. This I cannot consider entirely wasted effort, since it has enabled me to more exactly formulate the position which he does occupy. I, however, do not like the simile, for I am sure I can speak for Professor Davis when I say that we are not enemies trying to knock down, undermine, or even disparage Professor Ferrel's work; neither are we partisans whose duty, as Mr. McAdie appears to think, is to look with special favor upon views promulgated by our own countrymen, and with corresponding disfavor upon views of foreigners. We are merely scientific men, trying, with the best knowledge we can command, to determine the truth about a matter which certainly admits of a difference of opinion. I did not set out with the ambitious task of stating a new theory which was to stand out as a rival to the life-work of Espy and Ferrel, but merely to quote certain facts which to me indicate that the present theory of cyclones as commonly understood needs modification. As a result of my reading and continuous observation of weather-maps, I frequently frame new hypotheses to enable me to more closely follow and anticipate the phenomena that are presented to me. Some of these I stated in my last communication, rather hoping that the criticism of Professor Ferrel's well-stored mind would enable me to gain more light on them.

Had not Ferrel so warmly espoused the condensation theory, I should not have thought this an essential part of his own. Is it not Espy's theory, rather than Ferrel's, that needs reconsideration? Ferrel's work has been in showing the effect of the earth's rotation on atmospheric currents, and, it seems to me, is unassailable. He has shown more convincingly than any other writer the possibility of the existence of dynamic gradients as distinguished from thermic gradients; and we find Teisserenc DeBort calculating by Ferrel's formula how much of each cyclone is to be attributed to thermic and how much to dynamic gradients, and even going so far as to show that cyclones may exist in which there is only a dynamic gradient, the thermic gradient having disappeared. In his last article in *Science*, Professor Ferrel, in speaking of low temperature as a cause of high-pressure areas, says, "While I regard this as adequate to account for it, I have never said or thought that it is the only cause, but simply the principal cause. I think there are other causes, especially in the origin of these high-pressure areas."

In speaking of the case referred to by me of a long trough of low pressure becoming nearly circular by the increase of pressure at both ends, he says, "I do not say that in such a case there would not be a certain very small amount or gyratory movement produced by the air flowing into the trough while it was filling up, as it would be at once if there were no restraining force to keep the air from the high pressure on each side from rushing in."

But Professor Ferrel will say these are only secondary effects, and there must be an originating and sustaining force behind them. This he finds in differences of temperature in adjacent bodies of air, even admitting that cyclones of moderate power may exist without precipitation.

I do not think any one who has entered into this discussion, unless it be Professor Hazen, has doubted that differences of temperature resulting from solar energy is the ultimate power from which all cyclonic and anticyclonic phenomena are derived. I stated as clearly as I could, in my last article, that differences of temperature between pole and equator, ocean and continent, were, in my opinion, the ultimate cause of differences of pressure over large areas, and indirectly the cause of the smaller cyclones and anticyclones of our weather-maps. I have just read my statements over, and do not see how I could have made them any clearer, though Professor Ferrel apparently failed to understand them, and quotes for my benefit the fable of a tortoise standing on nothing and supporting the world.

Loomis believed that areas of high pressure, which he placed as the antecedent phenomena in the development of cyclones, were mainly the result of low temperature. Hann finds in the temperature gradient between equator and pole the force which originates and maintains cyclones.

As I understand it, then, the point at issue is as follows: Ferrel maintains that the essential condition for the development and continuance of a cyclone is a higher temperature within the field of the cyclone than in the surrounding air. Loomis and Hann, while not denying that cyclones may thus originate, conclude, as a result of the study of observational data, that cyclones also exist as secondary whirls resulting from atmospheric motions originating outside the area of the cyclone. The cyclones thus originated probably bear some analogy to the small whirls often seen in the current of a river.

I have little doubt that Ferrel's explanation of the general circulation of the winds is the correct one, and it is possible that the views of cyclone generation advanced by Loomis and Hann will need modification; but I believe that the observational data are sufficient to warrant the conclusion that the condensation theory needs modification.

Professor Ferrel appears to think that it is scarcely justifiable to advance a new hypothesis until it is certain that the older theory is inadequate. I cannot think, however, that this is the method by which science has been advanced. There was a time when the wave theory of light was less probable than the emission theory elaborated by the mathematical genius of Newton; and, if the less probable theory had not been thought over and discussed, the present position of optics could never have been reached. There was a time when the fluid theory of electricity was much more probable than any other; and, had not investigators sought other hypotheses which would explain the phenomena equally as well, or better, progress would have been greatly retarded.

Many other examples might be given, but these will suffice to show why I prefer the method of multiple hypothesis advocated by President Chamberlin to the method of not considering but one hypothesis or theory until it is absolutely certain that it is wrong.

If we only had some method of determining the air temperature at each successive height, it would be possible to calculate in any area of high pressure exactly how much of the high pressure was due to temperature, and how much was due to dynamic or other causes. There are certain limiting values, however, which observation and well-known physical laws render it safe to assume the mean temperature of any air-column will not depart greatly from: 1st, It is improbable that the decrease of temperature with height can ever be much or any greater than the adiabatic rate when the air above would be potentially heavier than the air below; 2d, It is improbable that the mean temperature of the air-column up

to 5,000 metres will be higher than the temperature observed at the earth's surface.

Taking the average decrease of temperature with height found from the observations on Pike's Peak and Mount Washington, and using the temperature and pressure recorded at stations on the daily weather-chart, I have, by Köppen's method, calculated the pressure at the height of 5,000 metres above a large number of areas of high pressure, and drawn isobars for this height. These show that above the larger number of winter anticyclones on our Western plains the pressure is lower than on the same latitude farther east. Even if we make the extreme assumption that there is no decrease of temperature above these anticyclones up to 5,000 metres, some of the cases will still show a lower pressure at this height than on the same latitude on each side. In these cases there seems no escape from the conclusion that the pressure at the earth's surface is due chiefly or entirely to the low temperature of the air. But there are other cases of anticyclones over these plains in the summer-time, and of anticyclones on our seacoast in winter, in which the temperature is as high as, or higher than, near the earth's surface within the anticyclones as on the same latitude farther west. In these cases it is sometimes difficult to get a lower pressure in the upper air above them, even though we assume the adiabatic rate of cooling. Moreover, I know that these high pressures on rare occasions extend up even to the cirrus region, for I have observed cirrus-clouds moving out from them toward the west in their south-west quadrant as the surface wind does near the earth. I am hence led to believe that there are two classes of anticyclones,— one due chiefly or entirely to low temperature, and the other due chiefly or entirely to dynamic causes. It seems to me probable that the same is true of cyclones.

H. HELM CLAYTON.

Blue Hill Observatory, Jan. 22.

Questions of Nomenclature.

PROFESSOR C. S. SARGENT, author of the "Silva of North America," says, in the first volume of that work, "I have adopted the method which imposes upon a plant the oldest generic name applied to it by Linnæus in the first edition of the 'Genera Plantarum,' published in 1737, or by any subsequent author, and the oldest specific name used by Linnæus in the first edition of 'Species Plantarum,' published in 1753, or by any subsequent author, without regard to the fact that such a specific name may have been associated at first with a generic name improperly employed."

To secure stability in nomenclature, it is obvious that the method adopted by Professor Sargent is the one which should universally be adopted by botanists. Other questions relating to botanical nomenclature are not so well settled as might be desired, and a few of these may be briefly stated, with the writer's present views concerning them.

The first in importance, perhaps, is the use of the names of forms at first described as varieties of other species, and later raised to specific rank, or *vice versa*. It would seem that the varietal name as first used should be adopted for the specific name when raised to specific rank, though many botanists have felt at liberty to rechristen them at pleasure. A varietal or subspecific name would, if this rule were followed, receive precedence over later names. Professor E. L. Greene, in "West American Oaks," has adopted the name *Quercus Palmeri* Engelm. in preference to *Q. Dunnii* Kell., although first published as a species under the latter name, *Q. Palmeri* having first been published as a subspecies by Dr. Engelmann, and later as a species. One is led to infer by Professor Greene's remarks, that, had *Q. Palmeri* been published as a variety instead of as a subspecies, he would have adopted Kellogg's name for the species, though why such a distinction is made is not very evident.

Bentham, in fact, held that the earliest published name, whether applied as a specific or varietal, belonged inalienably to that individual form, whether subsequently redescribed and raised to specific, or degraded to varietal rank.

"Once a synonyme always a synonyme," is a rule which I believe obtains among zoölogists in general, and should, if tenable with them, be adopted by botanists as well. This would necessitate some important changes if adopted; and as an instance may be noted the genus *Washingtonia*, now in use for our Californian fan-palms, a synonyme of *Sequoia*, having been unfortunately applied to our Californian giant before its application by Wendland to our palm.

If the facts permitted, some enterprising botanist might see fit to reinstate the coniferous genus, in which case the genus of palms would of necessity have to be renamed. Still, it seems like creating needless synonymy in this case to rechristen Wendland's genus, though strict adherence to the rule would render it imperative.

Uniformity in the method of citing the authors of species is another desideratum in botanical nomenclature. The most explicit custom is that adopted in general by zoölogists, — the enclosing in parentheses the name of the author of the species or variety, where originally given wrong rank, or referred to a genus incorrectly. While this is often cumbersome, yet it greatly facilitates subsequent work beyond question, and is preferable to the citing of the name of the author who has referred the plant in question to a different genus, or considered it as of different rank. The existing confusion in the manner of citations renders it impossible for a writer to do strict justice to the founders of species, unless he is favored with access to large botanical libraries, and blessed with abundant leisure for consulting original descriptions. The author of the species (or variety), it seems to the writer, is the one to be cited (if the system of double citation is discarded as inconvenient) in preference to the authority for its transferrence from one genus to another.

Another point upon which botanists are not fully agreed is the citation of names adopted in manuscripts or herbaria, and receiving earliest publication by others than their authors. It is the custom in America (and a sensible custom it is) to cite the real author's name, even when first described and published by another author (unless published by that author as of his own authorship). Thus, Nuttall is credited with the authorship of many genera and species first described by Torrey & Gray in the "Synoptical Flora," or by DeCandolle or others elsewhere.

It is now generally conceded that an author, after publishing a name, has no longer any right to substitute another name therefor in subsequent publications, even though the first name he finds to be a misnomer. This right, claimed by many of the older botanists of a past generation, is no longer contended for. It is also an open question as to how far published names may be changed or corrected by their own or subsequent authors.

A common Californian cactus is published by Prince Salm in "Cacteæ Horto Dyckensi," p. 91, as *Mamillaria Goodrichii* Scheer, named in honor of Mr. Goodrich. Professor Sereno Watson informs me that Seemann says in the "Botany of the 'Herald'" that it was a "Mr. J. Goodridge, surgeon," whom the plant was intended to commemorate in its name as its discoverer. The name, therefore, has been written *M. Goodridgii* by many subsequent authors. Gray (*Botanical Gazette*, ix. 53) inadvertently publishes *Antirrhinum Nivenianum*, and repeats this spelling on the following page. This was collected by Rev. J. C. Nevin, and it is obviously proper to write *A. Nevinanum*, as the former spelling was mere inadvertence or a typographical error. But in the instance of *Mamillaria Goodrichii*, as originally written there is less cause for change, since the man may not have been clear in his own mind as to the correct spelling of his name,— like Shakspeare, spelling it differently at different times.

C. R. ORCUTT.

San Diego, Cal., Jan. 20.

BOOK-REVIEWS.

Inorganic Chemistry. By WILLIAM JAGO. London and New York, Longmans. 12°. $1.50.

THIS text-book is intended to meet certain conditions of science-teaching prevalent in Great Britain, due to the work going on under the auspices of the Science and Art Department. It is a more advanced book than the author's "Elementary Text-Book" on the same subject, issued some time ago. The supervision of

the English science-teaching by the Science and Art Department is to a considerable extent that of an examining board, so that the book before us appears to be written with the purpose of supplying a most condensed array of facts. As each substance is taken up, we are told of its occurrence, mode of preparation, properties, industrial applications, and composition. The author is evidently thoroughly practical by nature, and does not devote much space to the interesting theoretical discussions in chemistry, which would seem to give the study its chief disciplinary value, before he proceeds to the detailing of the facts. But let all teachers interested examine the book, that they may at least know the methods pursued by some of their co-workers abroad.

AMONG THE PUBLISHERS.

THE contents of the *Magazine of American History* for February cover a wide field of subjects. The features of the geologist and geographer, Sir Roderick Impey Murchison, appear in the frontispiece, accompanied by a sketch of his career in scientific discovery. The contribution of Hon. John Jay, LL.D., entitled "The Demand for Education in American History," is the longest and most important article of the number. Mr. Jay says, "Our great authorities on history-teaching are agreed that rightly to understand, appreciate, and defend American institutions, the true plan is to know their origin and their history." The third paper, by Rev. D. F. Lamson, presents an account of the emigration from New England to New Brunswick in 1763. The fourth paper is an illustrated account of the antiquity of carriages, by Emanuel Spencer. The article which follows is also illustrated, being the story of Sir Walter Raleigh's settlements on Roanoke Island, called by its author, Dr. Stephen B. Weeks, "An Historical Survival." Rev. R. T. Cross writes of early explorations in Louisiana; H. E. Green contributes a description of "The Pickering Manuscripts" in Boston; and "The French Army in the Revolution," translated from the French by Miss Georgine Holmes, is concluded from the January number.

— Mr. Greenough White has issued through the press of Ginn & Co. a pamphlet on "The Philosophy of American Literature," in which he endeavors to show that our literature is a native growth, and not a mere offshoot of that of England. In our opinion, the attempt is a failure. Mr. White gives a brief but excellent sketch of American literature, exhibiting its chief characteristics in the various periods, as he conceives them, very clearly; but he fails entirely to discover any real originality, or any thing distinctively American in thought or sentiment. Students of the subject will doubtless like to read Mr. White's work; but we think it will make few converts to the author's view. For our part, we can find little in our native literature but a reflex of European ideas; and we doubt if there is now extant a single work by an American writer that will be read except for historical purposes in the twentieth century.

— Readers of "Robert Elsmere" will be glad to hear that the address delivered by Mrs. Humphry Ward at the opening of University Hall has been reprinted in pamphlet form by Macmillan & Co. The special religious aims of University Hall are set forth in the pamphlet, in which mention is also made of the beginning of class-teaching under the guidance of Dr. Martineau. The same firm announce for early publication "The Life of the Right Hon. Arthur McMurrough Kavanagh," who was remarkable, having been born without arms or legs, notwithstanding which he sat in Parliament for many years, and yachted, hunted, and shot, carrying on the ordinary pursuits of a country gentleman and landlord.

— In an article entitled "An American Kew," in *Lippincott's Magazine* for February, 1891, Julian Hawthorne advocates the establishment in America of botanical gardens akin to the Kew Gardens in England. "When American naturalists," says Mr. Hawthorne, "have been furnished with a place where they can

study new plants and determine their qualities and uses under cultivation, investigate the animal and insect pests of the vegetable kingdom that have injured and still menace local plantations, devise means to aid in providing the growing population of the continent with good things to eat and plenty of them, prosecute inquiries into the medicinal virtues of herbs, and, in a word, canvass the whole possibilities for good of the world of plants, we may expect to see our country enter upon a scene of prosperity not unworthy of our hopes and promises." This is an idea that deserves to meet with encouragement, and it is to be hoped that its suggestion will lead to its fulfilment. Charles Howard Shinn, in an article entitled "West of the Sierras," gives an excellent idea of the rapid growth and development of the State of California, as well as of its climatic advantages, the beauty of its scenery, the productiveness of its soil, etc. Mr. Shinn's descriptions of the winter resorts of California will have a particular interest at this season.

— The "Handbook of Florida," by Charles Ledyard Norton, just issued by Longmans, Green, & Co., New York, will certainly prove useful to tourists and intending settlers. The book is illustrated by forty-nine maps and plans, especial attention being given to county maps showing lines of railway. It is claimed that these last have never before been published together in such convenient shape.

— The Farmers' Alliance of Delaware has invited Professor Edmund J. James, president of the American Academy of Political and Social Science, to address the State convention at Wilmington on the subject of "Our System of Taxation in its Relation to the Farming Classes." The farmers wish to know especially whether any State has solved the problem of relieving the farming classes of the burdens which rest upon them. It will be interesting to learn what a theoretical student of taxation has to say upon this subject, and whether he will give the farmers much satisfaction. Would it not be a desirable thing for the government to call for a report upon our financial system from some of the expert students of taxation in the country, and try to find out whether the scholars have any thing valuable to say on this subject which is vexing everybody just now?

— The Shakespeare Society of New York, 21 Park Row, New York City, announces a four-text edition of "Hamlet," presenting a parallelization of the three versions of that play, which appeared in 1603, 1604, and 1623, exactly reproducing the archaic typography and characteristics of the same, *verb. lit. et punct.*, accompanied by a translation of the German version performed in Dresden in 1626, and supposed to have been brought into Germany from London by English actors in 1603, and which throws a curious historical light upon the actual stage reading of the tragedy as presented by the London actors. The project of a four-text "Hamlet" was a favorite with the New Shakespeare Society of London, which, as long ago as 1874, promised one, but succumbed to the typographical difficulties of the work, and finally abandoned the project. The New York Shakespeare Society believes it has surmounted those difficulties, and undertakes to furnish its subscribers, in or about the fall of 1891, with the four texts,— a volume in folio, about 16 x 10, printed on laid paper, de luxe, in the best style of The Riverside Press, about 200 pages, and bound in boards, parchment back, Bankside or Roxburge style. One hundred and fifty copies only are to be printed from the types, and hand-numbered under the society's direction.

— In *Outing* for February, 1891, we note "Cycling in Mid-Atlantic," by Osbert H. Howarth; "Rowing at Oxford," by Charles H. Mellen; "The Art of Daguerre," by Clarence B. Moore; "Tarpon-Fishing in Florida," by J. M. Murphy; "The Poodle," by E. H. Morris; "Ice-Fishing in the Sea of Azoff," by C. A. P. Talbot; "Wolf-Hunting in France," by Sidney H. Smith; and "Turkey-Tracking in Canadian Snow-Fields," by E. Sandys.